

What is claimed is:

1. A reverberation apparatus for creating an acoustic effect of an acoustic space which is arranged under an instruction of a user with a sound generating point for generating a sound and a sound receiving point for receiving the sound which travels from the sound generating point to the sound receiving point through sound ray paths within the acoustic space, and for applying the created acoustic effect to an audio signal representative of the sound, the reverberation apparatus comprising:

a storage section that stores a directional characteristic representing a directivity of the generated sound at the sound generating point;

a position determining section that determines a position of the sound generating point within the acoustic space on the basis of the instruction from the user;

an orientation determining section that determines an orientation of the sound generating point based on the position determined by the position determining section;

an impulse response determining section that determines an impulse response for each of the sound ray paths along which the sound emitted from the sound generating point travels to reach the sound receiving point, in accordance with the directional characteristic of the generated sound stored in the storage section and the orientation of the sound generating point determined by the

orientation determining section; and

a calculation section that performs a convolution operation between the impulse response determined by the impulse response determining section and the audio signal so as to apply thereto the acoustic effect.

2. The reverberation apparatus according to claim 1, wherein the orientation determining section identifies a direction to a given target point from the sound generating point at the position determined by the position determining section, and determines the orientation of the sound generating point in terms of the identified direction from the sound generating point to the target point.

3. The reverberation apparatus according to claim 2, wherein the orientation determining section sets the target point to the sound receiving point in accordance with the instruction by the user.

4. The reverberation apparatus according to claim 1, wherein the orientation determining section identifies a first direction to a given target point from the sound generating point at the position determined by the position determining section, and determines the orientation of the sound generating point in terms of a second direction making a predetermined angle with respect to the identified first direction.

5. The reverberation apparatus according to claim 4, wherein the orientation determining section sets the target point to the sound receiving point in accordance with the instruction by the user.

6. The reverberation apparatus according to claim 1, wherein the position determining section determines the position of the sound generating point which moves in accordance with the instruction from the user, and wherein the orientation determining section identifies based on the determined position of the sound generating point a progressing direction along which the sound generating point moves, and determines the orientation of the sound generating point in terms of the identified progressing direction.

7. The reverberation apparatus according to claim 1, wherein the position determining section determines the position of the sound generating point which moves in accordance with the instruction from the user, and wherein the orientation determining section identifies based on the determined position of the sound generating point a progressing direction along which the sound generating point moves, and determines the orientation of the sound generating point in terms of an angular direction making a predetermined angle with respect to the identified

progressing direction.

8. A reverberation apparatus for creating an acoustic effect of an acoustic space which is arranged under an instruction of a user with a sound generating point for generating a sound and a sound receiving point for receiving the sound which travels from the sound generating point to the sound receiving point through sound ray paths within the acoustic space, and for applying the created acoustic effect to an audio signal representative of the sound, the reverberation apparatus comprising:

a storage section that stores a directional characteristic of a sensitivity of the sound receiving point for the received sound;

a position determining section that determines a position of the sound receiving point within the acoustic space on the basis of the instruction from the user;

an orientation determining section that determines an orientation of the sound receiving point based on the position determined by the position determining section;

an impulse response determining section that determines an impulse response for each of the sound ray paths along which the sound emitted from the sound generating point travels to reach the sound receiving point, in accordance with the directional characteristic of the sensitivity for the received sound stored in the storage section and the orientation of the sound receiving point

determined by the orientation determining section; and

a calculation section that performs a convolution operation between the impulse response determined by the impulse response determining section and the audio signal so as to apply thereto the acoustic effect.

9. The reverberation apparatus according to claim 8, wherein the orientation determining section identifies a direction to a given target point from the sound receiving point at the position determined by the position determining section, and determines the orientation of the sound receiving point in terms of the identified direction from the sound receiving point to the target point.

10. The reverberation apparatus according to claim 9, wherein the orientation determining section sets the target point to the sound generating point in accordance with the instruction by the user.

11. The reverberation apparatus according to claim 8, wherein the orientation determining section identifies a first direction to a given target point from the sound receiving point at the position determined by the position determining section, and determines the orientation of the sound receiving point in terms of a second direction making a predetermined angle with respect to the identified first direction.

12. The reverberation apparatus according to claim 11, wherein the orientation determining section sets the target point to the sound generating point in accordance with the instruction by the user.

13. The reverberation apparatus according to claim 8, wherein the position determining section determines the position of the sound receiving point which moves in accordance with the instruction from the user, and wherein the orientation determining section identifies based on the determined position of the sound receiving point a progressing direction along which the sound receiving point moves, and determines the orientation of the sound receiving point in terms of the identified progressing direction.

14. The reverberation apparatus according to claim 8, wherein the position determining section determines the position of the sound receiving point which moves in accordance with the instruction from the user, and wherein the orientation determining section identifies based on the determined position of the sound receiving point a progressing direction along which the sound receiving point moves, and determines the orientation of the sound receiving point in terms of an angular direction making a predetermined angle with respect to the identified

progressing direction.

15. A reverberation program executable by a computer for creating an acoustic effect of an acoustic space which is arranged under an instruction of a user with a sound generating point for generating a sound and a sound receiving point for receiving the sound which travels from the sound generating point to the sound receiving point through sound ray paths within the acoustic space, and for applying the created acoustic effect to an audio signal representative of the sound, the reverberation program comprising the steps of:

providing a directional characteristic representing a directivity of the generated sound at the sound generating point;

determining a position of the sound generating point within the acoustic space on the basis of the instruction from the user;

determining an orientation of the sound generating point based on the determined position thereof;

determining an impulse response for each of the sound ray paths along which the sound emitted from the sound generating point travels to reach the sound receiving point, in accordance with the provided directional characteristic of the generated sound and the determined orientation of the sound generating point; and

performing a convolution operation between the

determined impulse response and the audio signal so as to apply thereto the acoustic effect.

16. A reverberation program executable by a computer for creating an acoustic effect of an acoustic space which is arranged under an instruction of a user with a sound generating point for generating a sound and a sound receiving point for receiving the sound which travels from the sound generating point to the sound receiving point through sound ray paths within the acoustic space, and for applying the created acoustic effect to an audio signal representative of the sound, the reverberation program comprising the steps of:

- providing a directional characteristic of a sensitivity of the sound receiving point for the received sound;

- determining a position of the sound receiving point within the acoustic space on the basis of the instruction from the user;

- determining an orientation of the sound receiving point based on the determined position thereof;

- determining an impulse response for each of the sound ray paths along which the sound emitted from the sound generating point travels to reach the sound receiving point, in accordance with the provided directional characteristic of the sensitivity for the received sound and the determined orientation of the sound receiving



point; and

performing a convolution operation between the determined impulse response and the audio signal so as to apply thereto the acoustic effect.

17. A reverberation method of creating an acoustic effect for an acoustic space which is arranged under an instruction of a user with a sound generating point for generating a sound and a sound receiving point for receiving the sound which travels from the sound generating point to the sound receiving point through sound ray paths within the acoustic space, and applying the created acoustic effect to an audio signal representative of the sound, the reverberation method comprising the steps of:

providing a directional characteristic representing a directivity of the generated sound at the sound generating point;

determining a position of the sound generating point within the acoustic space on the basis of the instruction from the user;

determining an orientation of the sound generating point based on the determined position thereof;

determining an impulse response for each of the sound ray paths along which the sound emitted from the sound generating point travels to reach the sound receiving point, in accordance with the provided directional characteristic of the generated sound and the determined

orientation of the sound generating point; and

performing a convolution operation between the determined impulse response and the audio signal so as to apply thereto the acoustic effect.

18. A reverberation method of creating an acoustic effect for an acoustic space which is arranged under an instruction of a user with a sound generating point for generating a sound and a sound receiving point for receiving the sound which travels from the sound generating point to the sound receiving point through sound ray paths within the acoustic space, and applying the created acoustic effect to an audio signal representative of the sound, the reverberation method comprising the steps of:

providing a directional characteristic of a sensitivity of the sound receiving point for the received sound;

determining a position of the sound receiving point within the acoustic space on the basis of the instruction from the user;

determining an orientation of the sound receiving point based on the determined position thereof;

determining an impulse response for each of the sound ray paths along which the sound emitted from the sound generating point travels to reach the sound receiving point, in accordance with the provided directional characteristic of the sensitivity for the received sound

and the determined orientation of the sound receiving point; and

performing a convolution operation between the determined impulse response and the audio signal so as to apply thereto the acoustic effect.